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Ethno-Entomophagy (*Valanga nigricornis*): Societal Perspectives, Natural Pest Control and Environmental Sustainability

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ABSTRACT

The practice of ethno-entomophagy has been going on for hundreds of years in Indonesia and has become a local culture and wisdom that still continues today. Of the many edible insects, *Valanga nigricornis* is one of the most popular. The aim of this research is to determine the views of local communities towards entomophagy and its impact on natural pest control and environmental sustainability. The method used is phenomenological research using snowball sampling techniques and quantitative descriptive research using purposive sampling techniques. The research area is 4 hectares of rice fields. Sampling was carried out in 5 plots with an area of 300 m2 each and was carried out once a year continuously for 3 years. The sampling time was chosen at the beginning of the dry season which is the peak time for corn production. The research results show that the main reasons and beliefs of local people towards the practice of entomophagy are caused by cultural factors, natural pest control, economic factors, and favorite foods. The results of sampling regarding *Valanga nigricornis* pest attacks showed low values for 3 consecutive years. The conclusion of this research is that ethno-entomophagy has a positive impact on local control of the natural pest *Valanga nigricornis.*

1. INTRODUCTION

In tropical countries, including Indonesia, consuming insects has been a part of people's culture for many years(Wijaya et al., 2019). There are many insect food menus that are popular with people and are still consumed today, even insect food menus have become the identity of a region. Entomophagy is a culture of consuming insects by humans, either part or all of the insect's body (Ardoin & Prinyawiwatkul, 2021). Entomophagy can be practiced in the form of larvae, pupae or adult insects. For example, consuming insects in larval form is *Rhynchophorus ferrugenesis*, in pupal form, for example *Hyblaea puera*, and many insect species are consumed in adult form, one of which is *Valanga nigricornis* (Barrett, 1996).

Valanga nigricornis is in the Orthoptera group and the Acrididae family. This insect has egg, nymph and adult life phases (incomplete metamorphosis). Eggs are usually laid in the soil to a depth of 5-8 cm covered with a hardened foam mass. The egg is cylindrical in shape with a tapered anterior end and rounded at the other end. Adult insects are parasites on several plants, especially corn plants (House, 2016). *Valanga nigricornis* attacks on corn crops begin at the beginning of the planting period until the peak of corn production. This species is detrimental because it eats parts of the corn plant stem which has the potential to kill and reduce the productivity of the corn plant. Therefore, *Valanga nigricornis* is a pest that is controlled in various ways, including the traditional method, namely by catching and then consuming it (Febry Afrianto et al., n.d.)

People, especially in Indonesia, have various reasons for practicing entomophagy. Among them are as an alternative food source, environmentally friendly protein source, easy to obtain, cheap price, and as a natural pest control effort. Some people believe that entomophagy has the

advantage of controlling pests naturally, cheaply and safely. The truth and relationship between insect consumption and natural pest control has not been scientifically tested and proven and needs to be studied more carefully. This research wants to know the community's perspective on the relationship between entomophagy and the success of natural pest control so that it can create a sustainable environment.

2. MATERIALS AND METHODS

2.1. Methods

The method used in this research is phenomenology study and quantitative descriptive. Phenomenology as the study of a person's life experiences or a method for studying how individuals subjectively perceive experiences and provide meaning to these phenomena. The use of a phenomenological approach is a very important research problem to understand the personal experiences felt by a group of individuals regarding a phenomenon, in this case the practice of enthomophagy as an effort to control natural pests. Meanwhile, the use of quantitative descriptive methods is to describe, research and explain the data obtained regarding the number of *Valanga nigricornis* pest attacks, and then draw conclusions from the phenomena that can be observed using numbers.

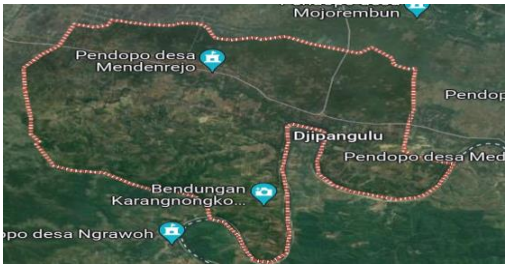
2.2. Study Area

Research was carried out consistently in rice fields in the Mendenrejo district, Blora district, Central Java. The research covered the same 5 plots every year for 3 consecutive years on 4 hectares of rice fields.

Table 1. Sampling Locations and Coordinate

Sampling Locations	Coordinate
Plot A	-7.241004, 111.431828
Plot B	-7.242011,111.434849
Plot C	-7.243641,111.437296
Plot D	-7.242686,111.432390
Plot E	-7.242831,111.437442

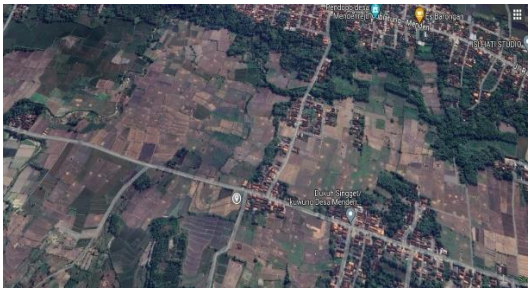
The map and each sampling location point are shown in the following pictures:



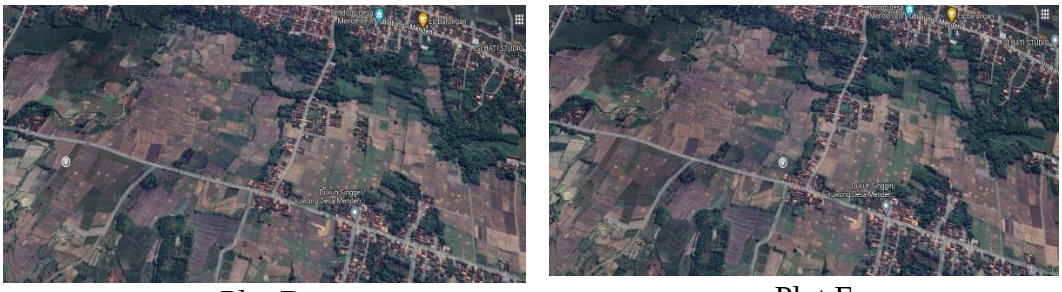
Sampling Locations

Plot A

Plot B



Plot C



Plot D Plot E

Figure 1. Sampling Location Point in Each Plots

2.3. Data Collection

2.3.1. Ethno-entomophagy

This research involved people living in the Bapangan hamlet, Mendenrejo Village, Kradenan Blora District. The research was conducted during the dry season for 3 years from 2021 to 2023. Primary data was obtained through the snowballing sampling method. Snowball sampling is a recruitment technique where research participants are asked to help researchers identify other potential subjects. The key information from the sample is men and women who are married.

2.3.2. Attack of Valanga nigricornis

The research was conducted at the start of the dry season from 2021 to 2023. With low rainfall, farmers in the area generally plant corn. At the same time, *Valanga nigricornis* also experiences faster reproduction, starting from larval maturation to becoming an adult individual. *Valangan nigricornis* attack data was obtained through sampling carried out in five plots, each plot 300 m2 in a rice field area of 4 hectares. The rice fields are actively planted with rice twice a year and corn once a year. Sampling was carried out during the corn planting season. Species were caught in the morning, afternoon and evening for 1 hour each for 14 days..

3. RESULTS AND DISCUSSION

3.1. Ethno-entomophagy

People have known the culture of consuming insects for decades, even hundreds of years. Apart from being consumed in adult form, several types of insects are also consumed in larval form. The larvae consumed come from the Lepidoptera order, *Hyblaea puera*. The adult insects consumed come from the Orthoptera order, *Valanga nigricornis*, which are pests of corn plants (Farrar et al., 1989). The time to consume *Valanga nigricornis* occurs at the end of the rainy season and the beginning of the dry season. In the rainy season, the primary crop in this rice field area is rice and in one year it can produce 2 harvests. When the dry season enters, farmers switch to planting corn. and at that time the Orthoptera larvae developed and metamorphosed more quickly, so that the *Valanga nigricornis* species was found in more abundant numbers than usual. The large number of *Valanga nigricornis* makes it easier for people to catch it and use it as an alternative food source. Various processing methods are used to produce varied menu dishes made from *Valanga nigricornis* as the main ingredient (Ainun et al., 2023).

Geographically and topographically, Mendenrejo village, Kradenan subdistrict, Blora district is an area with little water availability. When the dry season hits, people adapt to obtain alternative food sources while protecting their crops from being attacked by pests. The idea of consuming insects is a creative solution to overcome two problems at once. People have different main reasons for consuming *Valanga nigricornis*.

Figure 2. Community Perspective regarding *Valanga nigricornis* entomophagy viewed from various aspects

Based on snowball interviews that have been conducted, the public's perspective on entomophagy is known from various aspects.

Table 2. Public's Perspective on Entomophagy Is Known From Various Aspects

Aspects of entomophagy	Community Perspective
Main reason	Ancestral traditions The tradition of consuming grasshoppers is part of local wisdom which is still maintained today. Moreover, the abundance of *Valanga nigricornis* occurs in certain seasons, especially when the planting season changes from rice to corn at the beginning of the dry season, so this practice has become a momentum that most people have been waiting for. Natural pest control Entomophagy is believed to play a role in local natural pest control in the area. Local pest control can also replace the use of pesticides which have various impacts on organisms other than the target organism, reducing soil quality and health effects on consumers. Economic factors Obtained for free without spending any money and without having to raise livestock first. Favorite food Some people really like the taste of insects. A thick exoskeleton is actually a characteristic of the insect menu
Concumer	All family members aged over 4 years can consume processed *Valanga nigricornis* foods. It is believed that consumption of grasshoppers by children under 4 years old can cause allergies and digestive disorders. Proteins found in insects can also be called allergen proteins. One of the media that insects can occupy is dust particles. Dust allergies are caused by mites, which are a type of insect found in dust. Mites are a source of allergenic protein. This proves that insects found in the natural environment are a source of allergen protein (Wijaya et al., 2019).
How to obtain	People obtain *Valanga nigricornis* by manually trapping the species using trap nets
How to process	*Valanga nigricornis* can be processed through several processing techniques such as frying, soaking and boiling. Flavor variations include salty, spicy and sweet.

	Processing grasshoppers by boiling, frying and marinating can affect product quality characteristics for the parameters of water content, ash content, protein, fat and carbohydrates. The nutritional value of grasshoppers can be seen from the protein content resulting from proximate analysis in each processing method. The higher the protein content, the better the nutritional value. The processing process by frying, marinating and boiling affects the protein profile and protein molecular weight (Wijaya et al., 2019).
Health factors	It has been known for a long time that consuming *Valanga nigricornis* by some people can cause allergies or other clinical indications. The most common are itching, rashes on the skin, urticaria, swelling, digestive disorders including nausea, vomiting, diarrhea and even hematochezia
Commercial value	Apart from being consumed directly, *Valanga nigricornis* is also sold in traditional markets, either in processed or raw form

3.2. Attack of Valanga nigricornis

Research on the symptoms of insect pest attacks was carried out directly from the base of the stem to the top of the corn plant in 5 sample plots selected diagonally, each plot covering an area of 300 m2. Symptoms are then confirmed by checking for pests on the corn plants. Pest populations are observed by counting the number of individuals found. Identification of insect pests is carried out directly in corn planting areas. Pest research on corn plants was carried out 50 days after planting. Data collection is carried out once a year during the corn planting season for 3 consecutive years. The following data is obtained from each plot every year:

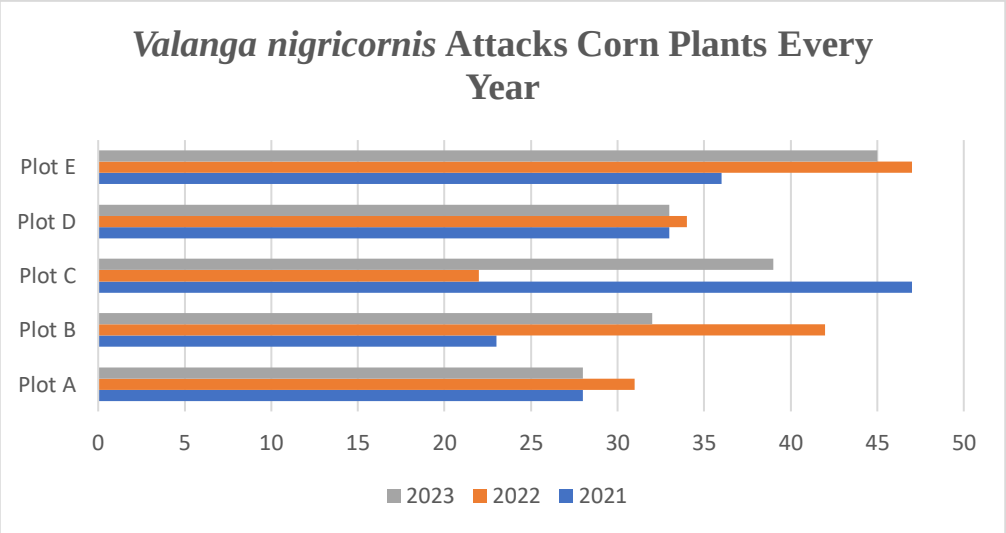


Figure 2. *Valanga nigricornis* Attacks Corn Plants Every Year

3.3. Enthomophagy of Valanga nigricornis on environmental sustainability

Various reasons are the basis for the practice of entomophagy for some people. The reason for ethno-entomophagy is still the main reason for local communities. Without them realizing it, this activity also has an impact on pest control, even though it is on a very small scale. Entomophagy activity occurs simultaneously with *Valanga nigricornis* attacks which are classified as very low every year. The practice of ethno-entomophagy also strongly supports reducing the use of chemical pesticides. Continuous use of pesticides has negative impacts, one of which is damage to agricultural land and environmental pollution. Pesticides cause soil fertility to decrease. The use of pesticides can also kill soil fauna, thereby reducing soil fertility. Continuous use of

pesticide fertilizers can cause the soil to become more acidic. Apart from that, the use of pesticides will actually have a negative impact on the surrounding land. Compounds containing pesticides are pollutants or even poisons for the safety of the human environmental ecosystem, including the soil and living environment. Therefore, ethno-entomophagy as a natural pest control effort is a wise step.

Apart from being a natural pest control agent, entomophagy is also an alternative source of protein that is environmentally friendly, with minimal impact on global warming when compared to consuming protein from various ruminant sources. Entomophagy can create a sustainable production system that will protect the environment and ensure food safety and security.

4. CONCLUSIONS

Ethno-entomophagy is the practice of consuming insects carried out by some local people who come from a background of local wisdom. This practice turns out to have a good impact on natural pest control, especially on the Valanga nigricornis species, even on a local scale. Entomophagy has been going on for a long time and for three consecutive years has shown an impact on highly controlled Valanga nigricornis pest attacks.

5. ACKNOWLEDGMENTS

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